TOY GUN

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The present invention relates to a toy gun, in which the shooting of bullets charged in a loading chamber and the automatic supply of the loading chamber with the bullets are caused by the action of a gas pressure and, more particularly, in which the bullets to be charged in the loading chamber and shot are exemplified by paint containing bullets for discharging paint when crushed.

DESCRIPTION OF THE RELATED ART

In the field of a model gun called the toy gun (or air soft gun) in which a bullet is short from a barrel in accordance with the operation of a trigger and in which a slider arranged along the barrel is moved for supplying a next bullet, there is known a toy gun, in which the shooting of a bullet charged in a loading chamber disposed at the back of the barrel is done by using a gas pressure and in which the automatic supply of a bullet to the loading chamber by the movement of the slider is also done by using the gas pressure.

Generally in this toy gun, the grip is provided with a magazine for holding a plurality of bullets, and an accumulation chamber for reserving gas. Each time the bullet charged in the loading chamber is shot by using the gas pressure from the

accumulation chamber formed in the grip, the gas pressure from the accumulation chamber is further used to move the slider backward and then forward in the direction along the barrel, so that the bullets held in the magazine disposed in the grip can be supplied to the emptied loading chamber and shot automatically. Usually in this toy gun in which the gas pressure is used to shoot the bullet charged in the loading chamber and to supply the bullet to the loading chamber, the gas to be reserved in the accumulation chamber is exemplified by a liquefied gas under a low pressure, and the bullet to be charged in the loading chamber is a sham one called the "BB bullet" made of plastics and having a relatively small diameter such as about 6 mm.

Apart from the toy gun using the aforementioned sham bullet of a diameter of about 6 mm, on the other hand, there is also known a toy gun, which uses a paint containing bullet (as will be called the "paint bullet") having a relatively large diameter exceeding 10 mm, such as about 17 mm and made easily crushable to discharge the paint (for example, as referred to the non-patent publication: "Monthly Magazine Gun, October", issued on October 1, 1992 by Kokusai Shuppan Kabushiki Gaisha, pp. 66 to 75).

In the toy gun using the paint bullet given a relatively large diameter and a relatively heavy weight by containing the paint, as disclosed in the aforementioned non-patent publication, a gas tank charged with carbonate gas (i.e., CO_2

gas) under a high pressure is arranged in the frame, and a magazine called the "loader" capable of holding a plurality of paint bullets is so mounted in the rear portion of the barrel with an upward protrusion through a feeding port.

In the frame, moreover, there are arranged a movable member formed by combining an upper bolt and a lower bolt, and a valve mechanism formed by arranging an exhaust valve movably in an air chamber formed by a cylinder member. The valve mechanism is provided with first and second gas passages and a connection gas passage for connecting those gas passages. When the trigger is pulled to shoot the paint bullet charged in the rear portion of the barrel, moreover, the movable member is advanced by the biasing force of a spring member to act on the movable member, thereby to provide the communication between the first gas passage formed in the valve mechanism and the barrel and to move the exhaust valve from the position, at which the gas pressure from the gas tank is not introduced into the connection gas passage, to the position, at which the gas pressure from the gas tank is introduced into the connection gas passage. As a result, the gas pressure from the gas tank flows into both the first and second gas passages through the connection gas passage. The gas pressure having entered the first gas passage is guided into the barrel so that it is used for shooting the paint bullet.

When the paint bullet is shot, moreover, the movable member,

which is caused when advanced to take the position for closing a feeding port from the barrel, is retracted by the raised gas pressure coming from the gas tank and acting through the second gas passage formed in the valve mechanism. As a result, the exhaust valve is moved from the position, at which the gas pressure from the gas tank is introduced into the connection gas passage, to the position, at which the gas pressure from the gas tank is not introduced into the connection gas passage, and the feeding port and the rear portion of the barrel are made to communication so that one of the paint bullets held in the loader drops by its own weight to the rear portion of the barrel through the feeding port and is charged. Each time the paint bullets charged in the rear portion of the barrel are shot, the emptied barrel is automatically supplied at its rear portion with a new paint bullet.

In the aforementioned toy gun in which the shooting of the paint bullet charged in the rear portion of the barrel acting substantially as the loading chamber and the supply of the paint bullet to the rear portion of the barrel are performed by using the gas pressure, the gas pressure from the gas tank is introduced into the first gas passage through the connection gas passage by the movement of the exhaust valve, as caused by the forward movement of the movable member, and the gas pressure from the gas tank is also partially introduced into the second gas passage through the connection gas passage when it is used for shooting

the paint bullet. However, the introduction of the gas pressure into the second gas passage is substantially the leakage of the gas pressure from the connection gas passage, for the time period from the introduction start to the instant when the paint bullet is shot by the gas pressure introduced into the first gas passage, so that the gas pressure to be guided from the gas tank to the connection gas passage for shooting the paint bullet is partially lost. In the toy gun constructed to avoid the situation in which the gas pressure to be used for shooting the paint bullet might otherwise be partially lost, moreover, gas under a high pressure has to be employed, so that the gas tank as the gas supply source is so charged with a high-pressure gas such as the CO_2 gas as to ensure the shooting the paint bullet having a relatively heavy weight.

In the toy gun which is adapted to shoot the paint bullet and to supply the paint bullet to the loading chamber by utilizing the gas pressure, therefore, it is desired to avoid the situation, in which the gas pressure to be used for shooting the paint bullet charged in the loading chamber might otherwise be partially lost. It is accordingly desired that the paint bullet charged in the loading chamber is reliably shot even by using the low-pressure gas. In the prior art, however, there has not been found the toy gun, which can satisfy those desired.

OBJECTS AND SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a toy gun which is adapted to shoot a paint bullet and to supply the paint bullet to a loading chamber by utilizing gas pressure, and which avoids the aforementioned disadvantages encountered with the prior art.

Another object of the present invention is to provide a toy gun, which can be freed from the situation that gas pressure to be used for shooting a bullet from a loading chamber might otherwise be partially lost, when the shooting of the bullet charged in the loading chamber disposed in a barrel and the supply of the bullet to the loading chamber are done by using the gas pressure, and which can reliably shoot a paint bullet charged in the loading chamber, even when the bullet to be charged in the loading chamber is the paint bullet having a relatively heavy weight and when the gas to be used is exemplified by gas under a lower pressure than that of CO_2 gas.

According to the first aspect of the present invention, there is provided a toy gun comprising: a frame including a barrel, a loading chamber formed in the barrel, a magazine for holding bullets to be charged in the loading chamber, and a trigger; a movable member arranged with a pressure receiving potion in the frame and made movable in a first direction toward the loading chamber and in a second direction opposed to the first direction; a drive mechanism for moving the movable member in the first direction in response to the operation of the

trigger; a gas supply controller connected to a gas outlet passage for taking a gas supply state, in which gas is supplied, as the movable member moves in the first direction; and a gas flow control mechanism arranged movably with respect to the movable member and forming a first gas passage for guiding the gas into the loading chamber and a second gas passage for guiding the gas to the pressure receiving portion, whereby, for a period in which the gas supply controller takes the gas supply state as the movable member moves in the first direction, the gas flow control mechanism transfers from a first state, in which the first gas passage is opened whereas the second gas passage is closed to supply the gas obtained in the gas outlet passage to the loading chamber through the first gas passage, to a second state, in which the first gas passage is closed whereas the second gas passage is opened to apply the gas obtained in the gas outlet passage to the pressure receiving portion through the second gas passage, so that the movable member is moved in the second direction thereby to make preparations for supplying the ballet from the magazine to the loading chamber.

In the second aspect of the invention, paint the bullets to be held in the magazine are paint bullets for discharging paint when crushed.

In the toy gun thus constructed according to the invention, the gas supply controller is held in the gas supply state to supply the gas to the gas outlet passage, accordingly as the

movable member moves in the first direction to the loading chamber in accordance with the operation of the trigger. The gas thus supplied to the gas outlet passage is guided to the loading chamber through such the first gas passage in the gas flow control mechanism to open the first gas passage and to close the second gas passage so that it is used for shooting the bullet charged in the loading chamber. This bullet shooting, i.e., the movement of the bullet from the loading chamber lowers the gas pressure in the gas flow control mechanism. By the action of the gas flow control mechanism accompanying the lowering of the gas pressure, the first gas passage is changed from the open state to the closed state, and the second gas passage is changed from the closed state to the open state. As a result, the gas, as fed to the gas outlet passage by the movement of the movable member in the first direction to the loading chamber, acts the pressure receiving portion formed on the movable member through the second gas passage so that the movable member is moved in the second direction apart from the loading chamber, to take the state for making preparations for supplying the loading chamber with the bullet.

In the gas flow control mechanism, therefore, when the gas fed to the gas outlet passage is fed to the loading chamber through the first gas passage, the second gas passage is closed to prevent the situation, in which the gas flows into the second gas passage. As a result, the situation, in which the gas

pressure to be used for shooting the bullet charged in the loading chamber is partially lost, is reliably avoided to use the gas supplied to the gas outlet passage, effectively for shooting the bullet. As a result, not only in case the bullet to be supplied from the magazine to the loading chamber is exemplified by the paint bullet having a relatively heavy weight but also in case the low-pressure gas is supplied from the gas supply means to the gas outlet passage, it is possible to shoot the paint bullet reliably from the loading chamber.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional view presented for describing the construction and actions of one embodiment of a toy gun according to the invention defined in any of Claims 1 to 6;

Fig. 2 is a sectional view presented for describing the construction and actions of the embodiment shown in Fig. 1;

Fig. 3 is a sectional view presented for describing the construction and actions of the embodiment shown in Fig. 1;

Fig. 4 is a sectional view presented for describing the construction and actions of the embodiment shown in Fig. 1;

Fig. 5 is a sectional view presented for describing the construction and actions of the embodiment shown in Fig. 1;

Fig. 6 is a sectional view presented for describing the construction and actions of the embodiment shown in Fig. 1;

Fig. 7 is a sectional view presented for describing the

construction and actions of the embodiment shown in Fig. 1; and

Fig. 8 is a sectional view presented for describing the construction and actions of the embodiment shown in Fig. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Fig. 1 is a sectional view presented for describing the construction and actions of one embodiment of a toy gun according to the invention defined in any of Claims 1 to 6.

The embodiment shown in Fig. 1 is provided with a barrel 2, a loading chamber 4 disposed on the rear side of the barrel 2, a magazine 5, a gas chamber 8, a movable member 10, a trigger 30, and a frame 40 having a grip 31. The magazine 5 is located above the loading chamber 4 and enabled to hold a plurality of paint bullets P, which have a relatively large diameter of about 11 mm and which discharge paint when crushed, for example. Moreover, the magazine 5 is provided with a bullet discharge port 5a, which has a diameter slightly larger than that of the paint bullet P held in the magazine 5 while confronting the loading chamber 4, so that the loading chamber 4 is supplied with one paint bullet P when this paint bullet P drops by its own weight into the loading chamber 4 through the bullet discharge port 5a.

The paint bullet P having dropped by its own weight from the magazine 5 in the loading chamber 4 takes an inlet position

4a and a loading position 4b ahead of the former in the loading chamber 4. The positioning of the paint bullet P at the inlet position 4a in the loading chamber 4 is done by a retaining member, which has a pair of small protrusions 32 (although only one is shown) and is arranged in the loading chamber 4, and a gas flow control mechanism 50, which will be described hereinafter. On the other hand, the positioning of the paint bullet P at the loading position 4b in the loading chamber 4 is done by both an annular seal member 33, which is arranged in the loading chamber 4, and the gas flow control mechanism 50.

To the gas chamber 8, there is connected a gas outlet passage 34. In this gas outlet passage 34, there is arranged a control valve 35, which is made movable in the direction along the barrel 2. The gas outlet passage 34 is extended upward from the gas chamber 8 and has an upper opening 34a opened in the vicinity of the loading chamber 4. The gas outlet passage 34 is so controlled by the control valve 35 arranged therein that it is kept at an open state, in which it communicates with the gas chamber 8, and at a closed state, in which its communication with the gas chamber 8 is blocked.

The control valve 35 includes a valve function portion 35a held in the gas chamber 8, and a piston portion 35b having a coil spring 36 wound thereon. The control valve 35 is biased by the coil spring 36 in the direction to keep the gas outlet

passage 34 in the closed state. In the piston portion 35b of the control valve 35, moreover, there is inserted a lock member 38, which can move up and down. This lock member 38 has radially enlarged upper and lower end portions, and a coil spring 39 is arranged in the lower end portion. This coil spring 39 applies the upward and downward biasing forces to the lock member 38.

When the control valve 35 takes the position, at which the gas outlet passage 34 is kept in the closed state by the valve function portion 35a, as shown in Fig. 1, it brings the piston portion 35b into downward abutment against the lower end portion of the lock member 38 and blocks the upward movement of the lock member 38 against the biasing force of the coil spring 39 thereby to keep the lock member 38 at a lower position.

With the gas chamber 8, moreover, there communicates a gas supply passage 41, to which there is connected a pipe 42 extending from the external gas supply source such as a gas bomb. The gas supply passage 41 introduces the gas, as supplied from the external gas supply source via the pipe 42, into the gas chamber 8.

The movable member 10 engages with a hole 11, which is so formed in the frame 40 at the back of the barrel 2 as to extend in the direction along the barrel 2, so that it can move in the direction toward the loading chamber 4 and in the opposite direction apart from the loading chamber 4. With respect to that movable member 10, moreover, the gas flow control mechanism

50 is so arranged movably in the direction along the barrel 2 while being partially inserted in the movable member 10. To this movable member 10, on the other hand, there is connected a drive mechanism 15 for it. This drive mechanism 15 is constructed to include a moving member 16 engaging mechanically with the movable member 10, and a coil spring 43 extending to the outside from a hole 17 opened in the rear end portion of the moving member 16. An engaging step 18 is formed on the lower portion of the moving member 16.

In connection with the drive mechanism 15, in the portion of the frame 40 below the hole 11, there is disposed a bottomed cylindrical guide 44, which extends in the direction along the barrel 2. A stem 45 is disposed at the back of the bottomed cylindrical guide 44. In the bottom of this bottomed cylindrical guide 44, there is formed a through hole 46, into which the piston portion 35b of the control valve 35 is movably inserted. The stem 45 protrudes from the rear side portion in the frame 40 toward the bottomed cylindrical guide 44.

The moving member 16 constructing the drive mechanism 15 is inserted from its front end side into the bottomed cylindrical guide 44. Moreover, the coil spring 43 constructing the drive mechanism 15 is wound on the stem 45 formed at the frame 40 and has a portion inserted in the hole 17 formed in the moving member 16. As a result, the coil spring 43 is guided by the bottomed cylindrical guide 44 to apply such

a biasing force to the moving member 16 as to move forward together with the movable member 10.

The movable member 10 includes a cylindrical portion 12 forming its front side portion, and a bottomed cylindrical portion 13 formed to extend to the cylindrical portion 12. This cylindrical portion 12 formed such that the diameter of its forming internal space is made larger than that of the internal space formed by the bottomed cylindrical portion 13, and is provided with a front end portion 12a made relatively thicker. The bottom portion of the bottomed cylindrical portion 13 forms a first pressure receiving portion 14, on which the gas pressure from the gas chamber 8 is caused to act selectively. In the bottom portion of the bottomed cylindrical portion 13 having such first pressure receiving portion 14, there is formed a housing portion, in which there are arranged a piston plunger 20 and a coil spring 21 for applying a biasing force on the former. The front end face of the piston plunger 20 forms a second pressure receiving portion 22, to which the gas pressure from the gas chamber 8 is selectively applied. In short, the movable member 10 is provided with the first pressure receiving portion 14 and the second pressure receiving portion 22 formed on the piston plunger 20.

The gas flow control mechanism 50, as arranged movably in the movable member 10, is provided with a first gas passage 51, a second a gas passage 52, and a gas passage forming portion

55 forming a connection passage 53 for connecting the first gas passage 51 and the second gas passage 52. And, the gas flow control mechanism 50 is biased in the direction toward the bottom of the bottomed cylindrical portion 13 by a coil spring 47, which is arranged between the portion in the gas passage forming portion 55 forming the second gas passage 52 and the front end 12a in the cylindrical portion 12 of the movable member 10.

The first gas passage 51 in the gas passage forming portion 55 is extended from the connection passage 53 toward the loading chamber 4 and is opened to the loading chamber 4. On the other hand, the second gas passage 52 in the gas passage forming portion 55 is extended from the connection passage 53 toward the second pressure receiving portion 22 and is opened to the first and second pressure receiving portions 14 and 22. The gas passage forming portion 55 has its portion forming the second gas passage 52 inserted slidably in the hole 11 so that it can move in the direction along the moving direction of the movable member 10, i.e., in the direction along the barrel 2. On that portion in the gas passage forming portion 55 to form the second gas passage 52, there is mounted an annular seal member 56, which is made of an elastic member. This annular seal member 56 abuts against the cylindrical inner wall of the bottomed cylindrical portion 13 to seal up the clearance between that cylindrical inner wall and the outer circumference of that portion in the

gas passage forming portion 55, which forms the second gas passage 52.

Moreover, the gas flow control mechanism 50 is provided with a movable valve 60 including a current plate portion 57 extended in the first gas passage 51, and a valve function portion 58 disposed on the rear end side of the current plate portion 57 and arranged in the connection passage 53. The current plate portion 57 is constructed by mutually connecting a plurality of current plates for uniforming the flow of the gas through the first gas passage 51. A coil spring 61 is engaged with the rear side of the valve function portion 58. The movable valve 60 thus provided with the current plate portion 57 and the valve function portion 58 opens/closes the first gas passage 51 and the second gas passage 52 and is biased by the coil spring 61 in the direction toward the loading chamber 4.

The trigger 30 is turnably attached through a pin 65 to the frame 40. The trigger 30 engages at its upper end side with a coil spring 66 arranged in the frame 40, so that it takes an operation starting position, as shown in Fig. 1, when the coil spring 66 takes the longest state, for example. On the rear side of the trigger 30, there is arranged a plate-shaped portion 68, which is selectively connected to the moving member 16 through a connection member 67. The plate-shaped portion 68 is turnably attached to the trigger 30 through a pin 69 and is biased in the direction to protrude to the outside from the

rear end of the trigger 30 by the spring member (although not shown) wound on the pin 69.

The connection member 67 is provided with a front abutment portion 67a for abutting selectively against the plate-shaped portion 68, and a rear abutment portion 67b for abutting selectively against the engaging step 18 formed on the moving member 16. The connection member 67 is further provided at its central portion with a slot 67c, in which a pin 70 mounted in the frame 40 is inserted. To the front side of the connection member 67, there is connected to the other end of a coil spring 71, one end of which is connected to the frame 40. This coil spring 71 applies such a biasing force to the connection member 67 as turns it in the counter-clockwise direction, as seen in Fig. 1. Therefore, the connection member 67 can be displaced within such a range by the biasing force of the coil spring 71 as is defined by the slot 67c having the pin 70 inserted therein. Although not shown, the frame 40 is provided with a stopper member for regulating the displacement of the connection member 67.

In the embodiment of the toy gun thus constructed according to any of Claims 1 to 5, when the trigger 30 takes the operation starting position, as shown in Fig. 1, the control valve 35 is caused by the biasing force of the coil spring 36 to take the position, at which it closes the gas outlet passage 34 to block the gas flow from the gas chamber 8 to the gas outlet

passage 34, thereby to keep the lock member 38 at the lower position. Moreover, the plate-shaped portion 68 comes upward into abutment against the front abutment portion 67a of the connection member 67 thereby to regulate the turn of the connection member 67 according to the biasing force of the coil spring 71.

At this time, the connection member 67 brings its rear abutment portion 67b into abutment against the engaging step 18 formed on the moving member 16, so that the moving member 16 may take a reference position, at which the movable member 10 is at the back of the upper end portion of the lock member 38 to take the lower position, and may keep an initial position, at which the front end of the moving member 16 is slightly inserted into the bottomed cylindrical guide 44. When the movable member 10 takes such reference position, the piston plunger 20 takes a forward position according to the biasing force of the coil spring 21, and abuts against the rear end of the gas passage forming portion 55 in the gas flow control mechanism 50. With the state in which the opening of the second gas passage 52 is closed by the second pressure receiving portion 22, therefore, the gas passage forming portion 55 is caused to keep the position slightly spaced from the first pressure receiving portion 14. The gas passage forming portion 55 thus placed at the position slightly spaced from the first pressure receiving portion 14 positions its portion forming the first gas passage 51, above

the upper opening 34a of the gas outlet passage 34.

When the movable member 10 takes the reference position, moreover, the movable valve 60 of the gas flow control mechanism 50 takes the forward position according to the biasing force of the coil spring 61. As a result, the valve function portion 58 in the movable valve 60 takes the position, at which it brings the first gas passage 51 into the closed state to block the communication between itself and the connection passage 53, and at which it brings the second gas passage 52 into the open state to communicate with the connection passage 53. Accordingly, the current plate portion 57 of the movable valve 60 takes the position, at which its leading end is protruded from the first gas passage 51 into the inlet position 4a of the loading chamber 4. The paint bullet P having dropped by its own weight from the magazine 5 into the loading chamber 4 is positioned at the inlet position 4a of the loading chamber 4 by the abutment against the leading end of the current plate portion 57 from the rear side and by the abutments against the paired small protrusions 32 from the left and right sides.

When the paint bullet P is thus positioned at the inlet position 4a of the loading chamber 4, the trigger 30 is pulled to turn on the pin 65 while compressing the coil spring 66 so that it goes from the operation starting position, as shown in Fig. 1, to an operation completing position, as shown in Fig. 2. Accordingly, the connection member 67 engaging with

the trigger 30 through the plate-shaped portion 68 is turned in the direction against the biasing force of the coil spring 71. As a result, the rear abutment portion 67b of the connection member 67 comes out of engagement with the engagement step 18 formed on the moving member 16, so that the moving member 16 starts its forward movement according to the biasing force of the coil spring 43. The moving member 16 thus moving forward moves (or advances) the movable member 10 connected mechanically thereto toward the loading chamber 4 while the front end 12a of the cylindrical portion 12 being caused to pass over the lock member 38 taking the lower position, thereby to drive the movable member 10. And, the moving member 16 proceeds in the bottomed cylindrical guide 44 toward the control valve 35.

As the movable member 10 advances, the gas flow control mechanism 50 closes the bullet discharge port 5a of the magazine 5 with that portion of the gas passage forming portion 55, which forms the first gas passage 51, and transfers the paint bullet P in abutment against the current plate portion 57 of the movable valve 60, in the loading chamber 4 from the inlet position 4a to the loading position 4b while riding over the small protrusions 32.

The advancing movable member 10 stops its movement toward the loading chamber 4 when the front end 12a of the cylindrical portion 12 abuts against the abutment portion 72 formed at the frame 40, as shown in Fig. 3. At this time, the moving member

16 collides against the piston portion 35b of the control valve 35 from the rear side thereby to move the control valve 35 in the direction against the biasing force of the coil spring 36. As a result, the gas outlet passage 34 is transferred from the closed state, in which its communication with the gas chamber 8 is blocked by the valve function portion 35a of the control valve 35, to the open state, in which it communicates with the gas chamber 8. In accordance with this movement of the control valve 35 from the closed state to the open state of the gas outlet passage 34, the lock member 38 is released from the state, in which it is kept at the lower position by the piston portion 35b, so that it is lifted by the biasing force of the coil spring 39 from the lower position to an upper position, at which its upper end abuts against the lower portion of the movable member 10.

The moving member 16 having stopped the movable member 10 by bringing it into abutment against an abutment portion 72 formed on the frame 40 abuts at its front end against the piston portion 35b of the control valve 35 at the position, it is spaced by a predetermined distance from the through hole 46 in the bottomed cylindrical guide portion 44, to hold the control valve 35 at a position to open the gas outlet passage 34 thereby to establish the gas flow from the gas chamber 8 to the gas outlet passage 34. As a result, the piston portion 35b abuts against the lower end of the lock member 38 taking

the upper position, from its rear side.

When the movable member 10 stops its movement toward the loading chamber 4, moreover, the paint bullet P transferred by the gas flow control mechanism 50 comes into abutment against the annular seal member 33 disposed in the loading chamber 4, and is positioned at the loading position 4b in the loading chamber 4 by the annular seal member 33 and the gas flow control mechanism 50. The paint bullet P abutting against the annular seal member 33 applies a pushing force in the direction against the biasing force of the coil spring 61 to the movable valve 60, and applies a pushing force in the direction against the biasing force of the coil spring 21 for bringing the piston plunger 20 into the forward position, to the gas passage forming portion 55.

As a result, the movable valve 60 takes the position, at which the first gas passage 51 is opened by its valve function portion 58 to communicate with the connection passage 53, and at which the second gas passage 52 is closed to block the communication with the connection passage 53, as shown in Fig. 3. Moreover, the gas passage forming portion 55 causes the piston plunger 20 to take a retracted position against the biasing force of the coil spring 21 thereby to bring its rear end into abutment against the first and second pressure receiving portions 14 and 22. As a result, the opening of the second gas passage 52 is continuously closed by the second pressure

receiving portion 22. Moreover, the connection passage 53 in the gas passage forming portion 55 is caused to communicate with the gas outlet passage 34 through the upper opening 34a.

On the other hand, the connection member 67 having the rear abutment portion 67b disengaged from the engaging step 18 formed on the moving member 16 is displaced by the biasing force of the coil spring 71 so that it is regulated by the not-shown stopper member at the position, where it contacts with neither the plate-shaped portion 68 nor the moving member 16, as shown in Fig. 3.

The gas outlet passage 34, as opened by the control valve 35, is supplied from the gas chamber 8 with the gas, which is introduced from the external gas supply source. Specifically, the gas chamber 8, the control valve 35, the coil spring 36, the lock member 38, the coil spring 39 and so on construct a gas supply controller for supplying the gas outlet passage 34 with the gas as the movable member 10 moves toward the loading chamber 4. And, the gas, as supplied to the gas outlet passage 34 from the gas chamber 8, abruptly flows into the connection passage 53, which is made to communicate with the gas outlet passage 34, in the gas flow control mechanism 50. The gas thus having abruptly flown into the connection passage 53 is guided to the loading position 4b of the loading chamber 4 through the first gas passage 51 opened by the valve function portion 58 of the movable valve 60. As a result, the high gas pressure

from the gas chamber 8 acts on the paint bullet P abutting against the annular seal member 33 so that the paint bullet P is so moved by the action of the gas pressure as to ride over the annular seal member 33 from the loading chamber 4 to the front of the annular seal member 33, as shown in Fig. 4.

The paint bullet P, as moved from the loading chamber 4 into the barrel 2 located in the front, is accelerated toward the leading end of the barrel 2 while receiving the gas pressure from the back. Thus, the paint bullet P is moved from the loading chamber 4 into the barrel 2 on the front side of the former and is accelerated in the barrel 2 toward the leading end of the same. Accordingly as the space in the barrel 2 at the back of the paint bullet P abruptly expands, the gas pressure in the loading chamber 4 and in the first gas passage 51 of the gas flow control mechanism 50 drops. As the gas pressure in the first gas passage 51 thus drops, the movable valve 60 is advanced in the gas flow control mechanism 50 by the biasing force of the coil spring 61. As a result, by the valve function portion 58 of the movable valve 60, the first gas passage 51 is closed to block its communication with the connection passage 53, and the second gas passage 52 is opened to communicate with the connection passage 53, as shown in Fig. 4. As the gas pressure in the first gas passage 51 thus drops, the paint bullet P having moved in the barrel 2 is shot from the leading end of the barrel 2 till the movable valve 60 is caused by its valve

function portion 58 to take the position, at which the first gas passage 51 is closed and at which the second gas passage 52 is opened.

In the gas flow control mechanism 50, as has been described above, the first gas passage 51 is closed, but the second gas passage 52 is opened. As a result, the gas outlet passage 34 is held in the state to communicate with the second gas passage 52 through the connection passage 53. Then, the gas from the gas chamber 8 through the connection passage 53 and the second gas passage 52 applies its high pressure to the second pressure receiving portion 22 for closing the opening of the second gas passage 52. This high gas pressure to act on the second pressure receiving portion 22 retracts the movable member 10 against the biasing force of the coil spring 43, as accompanied by the moving member 16 connected mechanically to the movable member 10. As a result, a pressure chamber 80 of a variable capacity is formed between the first and second pressure receiving portions 14 and 22 and the gas flow control mechanism 50, as shown in Fig. 5, the gas from the gas chamber 8 through the connection passage 53 and the second gas passage 52 applies its high gas pressure not only to the second pressure receiving portion 22 but also the first pressure receiving portion 14. Thus, the movable member 10 to receive the high pressure of the gas through the second gas passage 52 at the first and second pressure receiving portions 14 and 22 is abruptly retracted

while expanding the pressure chamber 80.

At this time, the piston plunger 20 having the second pressure receiving portion 22 is enabled to move from the retracted position to the forward position according to the biasing force of the coil spring 21, because the pressure chamber 80 of the variable capacity is formed between the second pressure receiving portion 22 and the gas flow control mechanism 50.

According to the retraction of the movable member 10 by the action of the gas pressure, the moving member 16 connected mechanically to the movable member 10 is spaced backward from the piston portion 35b of the control valve 35, as shown in Fig. 5. As a result, the control valve 35 starts its movement according to the biasing force of the coil spring 36, but this movement is instantly stopped by the abutment of the piston portion 35b of the control valve 35 from the front side against the lower end of the lock member 38 taking the upper position. As a result, there is continuously kept the state, in which the valve function portion 35a of the control valve 35 holds the gas outlet passage 34 in the open state.

The movable member 10, as caused to continue the retraction together with the moving member 16 by the action of the gas pressure from the gas chamber 8, brings the moving member 16 into abutment against the rear abutment portion 67b of the connection member 67, as shown in Fig. 6, and pushes the lock member 38 taking the upper position in the direction against

the biasing force of the coil spring 39 by the front end 12a of the cylindrical portion 12 thereby to move the same from the upper position to the lower position.

When the lock member 38 is moved from the upper position to the lower position, the control valve 35 is moved by the biasing force of the coil spring 36 to return from the state, in which the valve function portion 35a opens the gas outlet passage 34 to communicate with the gas chamber 8, to the state, in which the valve function portion 35a closes the gas outlet passage 34 to block the communication with the gas chamber 8. As a result, the flow of the gas from the gas chamber 8 into the gas inlet passage 34 is stopped. The piston portion 35b of the control valve 35 having closed the gas outlet passage 34 abuts against the lower end of the lock member 38 having reached the lower position, from the upper side, thereby to keep the lock member 38 at the lower position.

Even if the gas outlet passage 34 is thus closed by the control valve 35 thereby to stop the supply of the gas from the gas chamber 8 to the pressure chamber 80 of the variable capacity, the movable member 10 continues its further retraction by its inertia. Just before the movable member 10 moving together with the moving member 16 reaches the most retracted position, at which it stops the retraction while abutting against the rear end of the frame 40, as shown in Fig. 7, that portion of the gas passage forming portion 55, which forms the second

gas passage 52, comes out of engagement with the bottomed cylindrical portion 13 so that the gas flow control mechanism 50 is retracted as a whole together with the movable member 10 moving toward the most retracted position.

As a result, the sealing property of the pressure chamber 80 by the annular seal member 56 is lost so that the gas residing in the pressure chamber 80 and the gas residing in the second gas passage 52 are released to the atmosphere through a clearance 81 formed between the cylindrical portion 12 and that portion of the gas passage forming portion 55, which forms the second gas passage 52. The release of the gas residing in the second gas passage 52 to the atmosphere is also made through the connection passage 53, which is released from the mutual communication with the gas outlet passage 34. Moreover, that portion of the gas passage forming portion 55, which forms the first gas passage 51, is positioned above the upper opening 34a of the gas outlet passage 34.

Thus, the movable member 10, which has reached the most retracted position after the gas residing in the gas flow control mechanism 50 and the gas residing in the movable member 10 were released to the atmosphere, instantly turns together with the moving member 16 or the like to the state, in which it is advanced to the reference position by the biasing force of the coil spring 43, and the gas flow control mechanism 50 is retracted by the biasing force of the coil spring 47. The retraction of the

gas flow control mechanism 50 by the biasing force of the coil spring 47 is stopped, as shown in Fig. 8, by the abutment of the rear end of the gas passage forming portion 55 against the piston plunger 20 taking the forward position. In this situation, the opening of the second gas passage 52 in the gas passage forming portion 55 is closed by the second pressure receiving portion 22, and that portion of the gas passage forming portion 55, which forms the first gas passage 51, is positioned at the back of the loading chamber 4, thereby to cause the bullet discharge port 5a of the magazine 5 to communicate with the inlet position 4a in the loading chamber 4. As a result, the paint bullet P drops from the magazine 5 into the inlet position 4a in the loading chamber 4. The paint bullet P having dropped to the inlet position 4a is positioned by the current plate portion 57 in the movable valve 60 abutting the back of the paint bullet P and by the paired small protrusions 32.

The advance of the moving member 16 by the biasing force of the coil spring 43 is stopped, as shown in Fig. 8, when the moving member 16 is regulated in position by the connecting member 67 after the engaging step 18 formed on the moving member 16 abutted against the rear abutment portion 67b of the connection member 67 from the rear side and advanced the connection member 67 within the range defined by the slot 67c and the pin 70. When the moving member 16 is regulated in position by the connection member 67, the movable member 10

is placed at the reference position which is at the back of the upper end portion of the lock member 38 taking the lower position, and the moving member 16 is placed at the initial position, in which its front end portion is slightly inserted into the bottomed cylindrical guide portion 44. Moreover, the connection member 67 for regulating the position of the moving member 16 pushes the plate-shaped portion 68 formed on the trigger 30, with its front abutment portion 67a from the rear side thereby to turn the plate-shaped portion 68 in the direction against the biasing force of the not-shown spring member.

When the trigger 30 is released in this state from its pulling operation, the coil spring 66 returns from the compressed state to the longest state. As shown in Fig. 1, the trigger 30 is accordingly caused to return to the operation starting position, and the plate-shaped portion 68 displaces the connection member 67 while being turned in the direction according to the biasing force of the spring member acting thereon, and abuts against the front abutment portion 67a of the connection member 67 from the lower side thereby to regulate the turn of the connection member 67 in the direction according to the biasing force of the coil spring 71.

Thus, the connection member 67 is held in the state to regulate the position of the moving member 16, by bringing the plate-shaped portion 68 into abutment from its lower side against the front abutment portion 67a while being regulated in the

turn in the direction according to the biasing force of the coil spring 71, and by bringing the rear abutment portion 67b into abutment against the engaging step 18 formed at the moving member 16 taking the initial position. When the trigger 30 taking the operation starting position is pulled again in that state, the paint bullet P is shot from the loading chamber 4, as has been described hereinbefore, and is subsequently supplied to the loading chamber 4.

The embodiment of the toy gun provided with the gas flow control mechanism 50, as has been described hereinbefore, is freed from the following situation. When the paint bullet P is to be shot from the loading chamber 4, the second gas passage 52 in the gas flow control mechanism 50 is closed so that the gas pressure from the gas chamber 8 leading to the gas outlet passage 34 is not guided to the second gas passage 52. Therefore, there is reliably avoided the situation, in which the gas pressure to be used for shooting the paint bullet P from the loading chamber 4 might otherwise be partially lost. Therefore, the gas pressure from the gas chamber 8 is effectively applied to the paint bullet P charged in the loading chamber 4 so that the paint bullet P can be reliably shot from the loading chamber 4 even in case the gas to be supplied from the gas chamber 8 to the gas outlet passage 34 is exemplified by a low-pressure gas such as a liquefied gas.

Thus, the toy gun according to the invention specified

in the Claims, as exemplified by the toy gun according to the invention of Claim 6, may also be constructed by providing an accumulation chamber 8' to be charged with a low-pressure liquefied gas in the frame 40, in place of the gas chamber 8 in the embodiment shown in Fig. 1 to Fig. 8, so that the gas supply control means may include the accumulation chamber 8' to be charged with the low-pressure liquefied gas, in place of the gas chamber 8.

Moreover, the gas flow control mechanism 50 is constructed to include the gas passage forming portion 55 arranged movably in the movable member 10, and the movable valve 60 arranged movably in the gas passage forming portion 55, and is not assembled directly with the frame 40. Therefore, the gas flow control mechanism 50 makes the toy gun having itself, simple in construction and easy in assembly.

In the toy gun thus constructed according to the invention, as apparent from the gas supply controller is held in the gas supply state to supply the gas to the gas outlet passage, accordingly as the movable member moves in the first direction to the loading chamber in accordance with the operation of the trigger, and the gas thus supplied to the gas outlet passage is guided to the loading chamber through such the first gas passage in the gas flow control mechanism to open the first gas passage and to close the second gas passage so that it is used for shooting the bullet charged in the loading chamber.

This movement of the bullet from the loading chamber lowers the gas pressure in the gas flow control mechanism. By the action of the gas flow control mechanism accompanying the lowering of the gas pressure, the first gas passage is changed from the open state to the closed state, and the second gas passage is changed from the closed state to the open state. As a result, the gas, as fed to the gas outlet passage by the movement of the movable member in the first direction to the loading chamber, acts the pressure receiving portion formed on the movable member through the second gas passage so that the movable member is moved in the second direction apart from the loading chamber, to take the state for making preparations for supplying the loading chamber with the bullet.

In the gas flow control mechanism, therefore, when the gas fed to the gas outlet passage is fed to the loading chamber through the first gas passage, the second gas passage is closed to prevent the situation, in which the gas flows into the second gas passage. As a result, the situation, in which the gas pressure to be used for shooting the bullet charged in the loading chamber is partially lost, is reliably avoided to use the gas supplied to the gas outlet passage, effectively for shooting the bullet. As a result, not only in case the bullet to be supplied from the magazine to the loading chamber is exemplified by the paint bullet having a relatively heavy weight but also in case the low-pressure gas is supplied from the gas supply

means to the gas outlet passage, it is possible to shoot the paint bullet reliably from the loading chamber.